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A Comparison of Pre-Kindergarten and Pre-1st Grade Boys and Girls on Measures of School Readiness and Language Development. Interim Report.

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Although normative figures of the performance of late kindergarten and entering first grade students on standardized readiness measures are usually available in the test manuals, no such data is available for pupils about to enter kindergarten. In order to obtain such data, 638 kindergarten (P-K) children in Minnesota were tested on three instruments: (1) the Metropolitan Readiness Tests (MRT), (2) the Illinois Test of Psycholinguistic Abilities (ITPA), and (3) the Behavior Rating Scale. Some 570 prefirst-grade (P-1) children were also tested, including 300 of the children tested at the P-K level. It was found that P-K girls did significantly better on the MRT than P-K boys, and girls did better than boys at the P-1 level. Compared with norms available for P-1 children, the P-1 boys in this study fell at the thirty-fifth percentile; the girls, at the forty-second. On the ITPA, neither at the P-K level nor at the P-1 level did there exist overall differences in performance on the basis of sex. It appears, therefore, that the kindergarten experience tends to modify initial performance differences on the basis of sex towards uniformity rather than towards greater divergence in favor of the girls. P-K girls rated higher than the boys on all items of the Behavior Rating Scale, but at the P-1 level there was no significant difference. (WD)

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A Comparison of Pre-Kindergarten and Pre-1st Grade Boys and Girls on Measures of School Readiness and Language Development

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U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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Summary

The ITPA and the MRT were individually administered to 908 pre-kindergarten and pre-first grade children who had been born at the University of Minnesota Hospitals during a specified three-year period and who were participants in the Collaborative Perinatal Research Project. Results indicate that: (1) school readiness raw scores at pre-1st grade are approximately double those obtained at pre-kindergarten, (2) the kindergarten experience tends to modify sex diffenences initially favoring the girls on school readiness test scores and on test behavior ratings, (3) the few sex differences in language skills as measured by the ITPA which do exist tend to favor boys and to persist from pre-kindergarten to pre-first grade level, and (4) the ITPA norm tables do not provide sufficient range to adequately measure children in the age range 4-6 to 6-8 with essentially average total language age scores.

Introduction

Normative studies reporting the performance of late kindergarten and entering first grade students on standardized readiness measures are usually available in readiness test manuals. However, no such data are available for pupils about to enter kindergarten. The lack of this type of information precludes the use of these instruments as aids in making differential kindergarten assignments or adjustments in kindergarten curricula, and hinders investigations of the influence of kindergarten on the development of readiness skills.

The present study is concerned specifically with the development of descriptive data on the Metropolitan Readiness Tests (MRT) and the Illinois Test of Psycholinguistic Abilities (ITPA) for

youngsters who have not yet experienced the possibly modifying effects of kindergarten, and a comparison of these results with the performance of youngsters at the point of entrance to first grade.

Design

Subjects

Efforts were made to contact and test all children born at the University of Minnesota Hospitals between January 1, 1960, and December 31, 1962, who were participants in the Collaborative Perinatal Research Project.* Of the original population of 1401 children, 638 were tested prior to kindergarten entrance and 570 were tested prior to entering 1st grade. S's born in 1962 were tested during the summer preceding their expected entrance into kindergarten. S's born in 1961 were tested prior to kindergarten entrance and again before entering 1st grade. S's born in 1960 were tested once, prior to entrance into 1st grade.

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*This study, "The Collaborative Project for the Study of Cerebral Palsy, Mental Retardation, and other Neurological and Sensory Disorders of Childhood", is a major investigation in twelve medical centers of the antecedents of neurologically related childhood disorders. At each hospital, all pregnant women who came for care were encouraged to participate in the study. The University of Minnesota Hospitals' sample is comprised of families of graduate students, welfare clients, and middle class private patients, with the former two groups predominating.

TABLE 1

Children Tested at
Pre-Kdgn. & Pre-1st Grade

Year of Birth	Total Live Births	Died	Out of State	Couldn't Locate or Wouldn't Partic.	Tested Pre-Kdgn.	Tested Pre-1st
1960	424	20 (5%)	81 (19%)	54 (13%)		270 (61%)
1961	451	10 (2%)	125 (28%)	33 (07%)	296 (66%)	300 (67%)
1962	526	12 (2%)	130 (25%)	53 (10%)	338 (64%)	
Total	1401	42 (3%)	336 (24%)	140 (10%)	638 (65%)[1]	570 (65%)[2]

[1] 65% of all children born in 1961 + 1962

[2] 65% of all children born in 1960 + 1961

As shown in Table 1, 3 per cent of the original population of 1401 had died, 24 per cent were unavailable for testing due to geographic distance (all subjects within or near the boundaries of the state were tested) and 10 per cent either could not be located or declined to participate in the study. Nine hundred eight, or 65 per cent, of all children born at the University of Minnesota Hospitals during the specified three-year period participated in the present Educational Follow-Up Project.

Instruments

The Metropolitan Readiness Tests (MRT) are designed to measure the extent to which children have developed such skills and abilities as auditory and visual perception, motor coordination, linguistic skills, knowledge of numbers, and ability to pay attention and follow directions, all of which contribute to readiness for initial first grade work.

The Illinois Test of Psycholinguistic Abilities (ITPA) consists of the following nine subtests each designed to measure a specific aspect of psycholinguistic ability:

1) auditory decoding - comprehension of the spoken word
2) visual decoding - comprehension of pictures and printed words
3) auditory-vocal association - knowledge of meaningful relationships between spoken words
4) visual-motor association - knowledge of meaningful relationships between visual symbols
5) vocal encoding - expressing ideas in spoken words
6) motor encoding - expressing ideas in gestures

7) auditory-vocal automatic - prediction of future linguistic events based on grammatical rules
8) auditory-vocal sequencing - repetition of a sequence of symbols presented auditorally
9) visual-motor sequencing - reproduction of a sequence of symbols presented visually.

The Behavior Rating Scale was devised for the purposes of the Educational Follow-Up Project and was used to rate the test behavior of S's in the areas of attention span, cooperation, perseverance, and social poise, plus a rating of general test conditions.

Procedure

Parents of children born at the University of Minnesota Hospitals during the specified three year period were initially contacted by mail with an explanation of the purpose of the study and a request for their participation. This was followed by a phone call to set the appointment for testing the child in his own home if possible, or in a local school building if adequate space was not available in the home. The tests were administered during a single session with total testing time ranging from one and one-half to two hours.

Tests were administered by experienced Educational Examiners who had received special training in the administration of the instruments used in the project.

Data Analysis

Metropolitan Readiness Test

Table 2

Mean Raw Scores on Metropolitan Readiness Test at Pre-Kindergarten Level

	M (N=310)	F (N=324)	F Value	P
Word Meaning	6.14	5.94	.78	n.s.
Listening	6.53	7.08	4.26	.05
Matching	3.12	3.73	7.01	.01
Alphabet	3.14	4.39	15.76	.01
Numbers	5.38	6.13	5.81	.05
Copying	1.09	1.60	10.63	.01
Total	25.38	28.32	8.72	.01
Range	0-74	0-67		

In Table 2, mean MRT raw scores of pre-kindergarten children are presented separately by sex. With the exception of the Word Meaning subtest, all of the subtest scores as well as the total raw scores show significant differences in favor of the girls at either the .05 or .01 levels of significance when tested by an analysis of variance procedure.* The range of MRT total raw scores was from 0 to 74 for the boys and from 0 to 67 for the girls with the top scores falling in the "High Normal" range for beginning 1st grade students.

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*All statistical analyses were carried out at the University of Minnesota Computer Center by Dr. Douglas Anderson.

Table 3

Mean Raw Scores on Metropolitan Readiness Tests at Pre-1st Grade Level

	M (N=291)	F (N=272)	F Value	P
Word Meaning	9.00	8.82	.36	n.s.
Listening	8.79	9.11	2.34	n.s.
Matching	6.71	7.65	9.48	.01
Alphabet	7.04	8.58	14.80	.01
Numbers	11.11	11.57	1.15	n.s.
Copying	4.81	5.17	1.16	n.s.
Total	47.43	50.69	4.76	.05
Range	0-88	0-87		

Mean MRT raw scores of S's at pre-1st grade level are presented in Table 3. Here again the girls scored higher than the boys on all subtests with the exception of Word Meaning. However, the mean differences are significant for only two subtests, Matching and Alphabet (.01 level) and total raw score (.05 level).

The absolute raw score totals for both boys and girls at pre-1st grade level are almost double the scores obtained by pre-kindergarten children.

The MRT percentile norms are based on the performance of children tested during the first two or three weeks of 1st grade; however, according to the test manual they may be

used for "interpreting the results of tests administered ... during the interval between kindergarten and 1st grade." (MRT Manual of Directions, 1965) The mean raw score total for pre-1st grade boys falls at the 35th percentile and the mean raw score for pre-1st grade girls is at the 42nd percentile on these first grade norms. "Research with earlier forms of the MRT (MRT Manual, 1965) suggests that there may be an average difference of from 3 to 6 points in total score between late kindergarten and beginning 1st grade administration." This would result in an under-estimate of from 6 to 12 percentile points in assessing the relative position of the present study S's compared to the original norm group.

Total raw scores for both boys and girls at pre-1st grade fall within the range which the MRT manual terms "C" or "Average" for beginning 1st grade students with a prognosis of "likely to succeed in first grade work." By contrast, the pre-kindergarten means fall in the "D" or "Low Normal" range of scores.

Illinois Test of Psycholinguistic Abilities

ITPA raw scores were converted to language scores for analysis. Table 4 presents comparisons of mean language age scores of boys and of girls at the pre-kindergarten level. While there was no significant sex difference in total language age score, the boys performed significantly better than did the girls on Visual Decoding (.05 level) and Motor

Encoding (.01 level). Since the average chronological age of both boys and girls at the time of testing was 55 months, it is apparent that the mean language age scores of 58.32 for the boys and 57.83 for the girls tended to equal or exceed the actual chronological ages.

Table 4

Mean ITPA Language Age Score
at Pre-Kindergarten Level

ITPA	M (N=310)	F (N=324)	F Value	P
Auditory-Vocal Automatic	59.89	57.78	2.50	n.s.
Visual Decoding	63.03	60.13	3.85	.05
Motor Encoding	55.12	47.27	27.53	.01
Auditory-Vocal Association	59.01	60.88	1.94	n.s.
Visual-Motor Sequencing	54.33	56.41	3.03	n.s.
Vocal Encoding	61.21	58.40	2.64	n.s.
Auditory-Vocal Sequencing	61.65	59.92	1.42	n.s.
Visual-Motor Association	53.46	55.42	1.69	n.s.
Auditory Decoding	63.50	64.94	.77	n.s.
Total	58.32	57.83	.22	n.s.

Table 5

Mean ITPA Language Age Scores
at Pre-1st Grade Level

ITPA	M (N=291)	F (N=272)	F Value	P
Auditory-Vocal Automatic	71.35	70.89	.11	n.s.
Visual Decoding	75.55	71.32	8.57	.01
Motor Encoding	65.85	60.35	12.11	.01
Auditory-Vocal Association	73.77	75.50	1.70	n.s.
Visual-Motor Sequencing	67.03	67.55	.07	n.s.
Vocal Encoding	74.39	73.04	.53	n.s.
Auditory-Vocal Sequencing	70.79	68.88	1.53	n.s.
Visual Motor Association	67.85	73.65	5.43	.05
Auditory Decoding	77.93	78.88	.29	n.s.
Total	70.79	70.15	.36	n.s.

Mean ITPA language age scores at pre-1st grade level are presented in Table 5. Again there were no significant sex differences on total language age scores. However, boys at this level scored higher than girls on Visual Decoding and Motor Encoding (both significant at the .01 level) as they did at the pre-kindergarten level.

Although there were no sex differences on Visual-Motor Association at pre-kindergarten, the girls performed significantly better (.05 level) than the boys on this subtest at pre-1st grade. Again, the S's language age scores tended to equal or exceed their average chronological age of 67 months.

A check of the adequacy of the ITPA norms was done utilizing the 566 S's tested during the first year of the research project. These S's ranged in age from 4 years and 6 months to 6 years and 8 months. The ITPA manual (1961) provides tables for conversion of raw scores to language age scores for each of the individual subtests as well as for total raw scores. The minimum tabled language age scores range from 2 years and 3 months on Visual Motor Association to 2 years and 8 months on Visual Decoding. The maximum language age scores range from 8-6 on Auditory Vocal Sequencing to 9-6 on Auditory Vocal Automatic. In selecting the ITPA as one of the instruments in the present study it was anticipated that, with the exception of a few very low scoring children who might fall below the lower limits of the language age tables, the present group of S's would fall comfortably within the limits of the language

age norm tables provided in the manual. This expectation proved to be unwarranted.

Table 6

Number of Subjects With Scores Falling Beyond the ITPA Language Age Norms

1966 Summer Testing

N = 566

Subtest	L.A. Norms	Above L.A. Norms
Auditory-Vocal Automatic	6	0
Visual Decoding	20	8
Motor Encoding	11	8
Auditory-Vocal Association	6	2
Visual-Motor Sequencing	20	4
Vocal Encoding	6	42
Auditory-Vocal Sequencing	2	33
Visual-Motor Association	19	0
Auditory Decoding	7	73
Total ITPA	1	0
N	98	170

The number of raw scores falling either above or below the ITPA language age scales is shown in Table 6. The subtests involving the visual modality evidently provided the greatest difficulty for the current study population with 20, 20, and 19 S's respectively scoring below the tabled norms provided for Visual Decoding, Visual-Motor Sequencing, and Visual-Motor Association. By contrast, Auditory Decoding, Vocal Encoding, and Auditory-Vocal Sequencing appeared relatively less difficult for the same population with 73, 42, and 33 S's respectively scoring above the tabled language age norms. A total of 175 separate individuals scored either above or below the manual's norms on at least one of the ITPA

subtests, so that the limits of the language age tables proved insufficient in approximately 1/3 of all cases tested.

Behavior Rating Scale

Table 7

Mean Rating of Test Behavior
at Pre-Kindergarten Level

RATINGS OF TEST BEHAVIOR	M(N=310)	F(N=324)	F Value	P
Test Conditions	2.47	2.52	.77	n.s.
Attention Span	2.19	2.35	7.40	.01
Cooperation	2.45	2.51	1.14	n.s.
Perseverance	2.12	2.29	7.57	.01
Social Poise	2.29	2.33	.54	n.s.
Interest in Test Activities	2.26	2.37	3.86	.05

Mean ratings of test behavior and test conditions for pre-kindergarten S's are shown in Table 7. Original ratings ranged from Poor to Very Good. Each rating was assigned a numerical value from one to three, with a rating of Poor equal to one and a rating of Very Good equal to three. Girls rated higher than boys in all areas with statistically significant differences occuring on Interest in Test Activities (.05 level), Attention Span, and Perseverance (both at the .01 level).

On the mean ratings of test behavior for pre-1st grade S's, presented in Table 8, it should be noted that there were no significant differences between boys and girls and that the non-significant differences which did exist favor the males as often as they favor the females. These findings suggest the possibility

that the kindergarten experience may tend to erase or at least blur initial sex differences in the areas of behavior under investigation.

Table 8

Mean Ratings of Test Behavior
at Pre-1st Grade Level

RATINGS OF TEST BEHAVIOR	M(N=291)	F(N=272)	F Value	P
Test Conditions	2.53	2.55	.10	n.s.
Attention Span	2.59	2.61	.13	n.s.
Cooperation	2.76	2.70	1.53	n.s.
Perseverance	2.58	2.56	.15	n.s.
Social Poise	2.53	2.46	1.65	n.s.
Interest in Test Activities	2.52	2.54	.11	n.s.

Results

School readiness as measured by the MRT

1. At pre-kindergarten girls scored higher than boys on all subtests with the exception of Word Meaning. The differences were significant at the .05 level for Listening and Numbers and at the .01 level for Matching, Alphabet, and Copying as well as for Total Raw Score.
2. At pre-1st grade girls scored significantly higher than boys on only two subtests, Matching and Alphabet, both at the .01 level, and on Total Raw Score where the difference was significant at the .05 level.

3. Using the MRT norms which are based on a standardization population tested in early weeks of 1st grade, the average total score for boys fell at the 35th percentile and the average total score for girls fell at the 42nd percentile, when tested at pre-1st grade.
4. When tested at pre-1st grade, total MRT raw scores for both boys and girls fell within the "C" or "Average" range for beginning 1st grade students.
5. Total raw scores of both male and female pre-1st graders were almost double the total raw scores of pre-kindergarten children.

Language Development as measured by the ITPA

1. There were no significant sex differences on the ITPA Total Scores at either pre-kindergarten or pre-1st grade levels.
2. At both pre-kindergarten and pre-1st grade boys scored significantly higher than girls on Motor Encoding (.01 level) and Visual Decoding (.05 level at pre-kindergarten and .01 level at pre-1st).
3. There were no significant sex differences favoring the girls at pre-kindergarten and at pre-1st grade girls scored significantly higher than boys on only one subtest, Visual-Motor Association (.05 level).
4. At both pre-kindergarten and pre-1st grade the average language age scores of both boys and girls tended to

equal or exceed their average chronological age.

5. Thirty-one per cent of a sample of 566 children aged four and one-half to six years, with total language age scores closely approximating their chronological age, obtained raw scores beyond the limits of the ITPA language age conversion table on one or more subtests.

Ratings of Test Behavior

1. Pre-kindergarten girls rated significantly higher than boys on Attention Span and Perseverance (both at the .01 level) and Interest in Test Activities (.05 level). There were no significant sex differences in Cooperation, Social Poise or Test Conditions.

2. At pre-1st grade there were no significant sex differences in any area of test behavior.

Conclusions

1. These results indicate that the kindergarten experience tends to greatly modify sex differences initially favoring the girls, both on school readiness test scores and on test behavior ratings, leading to greater between sex uniformity of test performance and behavior on the part of boys and girls. Contrary to many opinions, these data do not support the idea that kindergarten exacerbates differences in school readiness skills by favoring girls over boys.

2. While there were few initial sex differences in language skills measured by the ITPA, those which did exist tended to favor the boys and were persistent but relatively uninfluenced by the kindergarten experience.

3. The finding that the ITPA norm tables which nominally extend from language age of 2 years and 3 months to 9 years and 6 months in actuality fail to provide sufficient range for a sample of 4½ to 6 year old children with essentially average total language age scores raises questions regarding the applicability of the test and the interpretation of scores for the age range it purports to measure.